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NYASALAND PROTECTORATE

Report of the Department of Agriculture For the year, 1948

PART II.—EXPERIMENTAL WORK

The staff position improved slightly during the year but there was little improvement in the labour supply. As a result all long-range experiments were maintained and one or two new ones started, but any real development of research work on an appreciable scale was impossible.

Tung Experimental Station. Cholo

Senior Agricultural Officer in charge : C. C. Webster

2. Shortage of labour again handicapped the work of the station, impairing the efficiency of the experiments because it was often impossible to carry out the requisite cultivations at the proper time and in all probability reducing the yields of budded clones. Plants were prepared in the nursery for planting a further 25 acres of experimental plots but, in the event, this could not be done as the land could not be cleared and prepared in time. Damage was suffered from two hailstorms which occurred in November, 1947, and as a result of this the first crop of a number of new clones under trial was lost.

Selection of Promising Mother Trees

3. The main work at the station continued to be the production of improved planting material of *Aleurites montana* by the selection of outstanding mother trees and their vegetative propagation on seedling rootstocks. For the second year in succession the survey of seedling plantations on estates was not extended, but a number of old areas were re-examined and a further number of promising trees selected. So far seedling plantations totalling rather more than 52,000 trees have been surveyed and from these, 749 outstanding trees have been provisionally selected for yield recording.

4. On the basis of several years' yield records the best of these provisional selections are chosen for propagation as buddings in clone trials, but this second step in selection is becoming somewhat difficult owing to the complications introduced by the fact that on many estates yields are being markedly reduced by lack of cultivation. In consequence many trees which have given very promising yields in the first one or two years of recording have subsequently declined in production and the difficulty is encountered of trying to assess how much of this decline is due to lack of cultivation and how much to inherent factors. It is becoming increasingly clear that mother tree records can only be a preliminary guide for selection and that the final choice must always be based on the performance of the budded progeny.

Vegetative Propagation as Buddings

5. As mentioned above, it was impossible to plant up a further acreage at the station this year and, consequently, the number of clones under trial has remained 100. The destruction of the crop on parts of the planted area by hail in November, 1947, deprived us of the first year's yield records from 42 clones and the results presented are confined to experiments previously recorded.

Buddings versus Seedlings

6. The superiority of buddings has continued to be demonstrated in two of the earlier experiments both of which were established in the latter part of 1940. The first of these is a small randomized block trial at Mandimwi Estate which simply compares buddings and unselected seedlings in ten randomized blocks with ten trees per plot, the budded plots containing two trees of each of five clones. The trial has not been a very satisfactory one, as yields have been low on account of poor soil and variability has been high owing to lack of uniform cultivation over the experimental area. In 1945 the crop was destroyed by a hailstorm which occurred at the time of fruit setting but in all other years buddings have given a significantly higher yield than seedlings although only at 5 per cent. probability level in three out of five seasons. The clone yields are shown in Table 2 from which it will be seen that on the four-year total yields the clone ZM13 is superior to all others. The low fertility and standard of cultivation has no doubt prevented the buddings from giving the yields of which they are potentially capable. It should also be mentioned that as the clones are amongst the earliest selections made from the relatively small Zomba plantation they only include one first-class clone, ZM13, and therefore the yields do not represent by any means the best which can be expected from buddings.

TABLE 1. MEAN YIELDS PER TREE, LBS. AIR DRY HULLED SEED

Age years :—	$2\frac{1}{4}$	$3\frac{1}{4}$	$5\frac{1}{4}$	$6\frac{1}{4}$	$7\frac{1}{4}$
Buddings	3.3	3.1	13.8	8.4	11.6
Seedlings	1.5	1.5	6.6	5.6	5.3
Sig. diff. P=0.05	1.49	1.33	3.62	2.58	3.19
„ „ P=0.01	2.00	1.78	5.20	3.71	4.58

TABLE 2. MEAN YIELDS PER TREE, LBS. AIR DRY HULLED SEED

Age years	Clones					Sig. diff.	
	ZM13	ZM8	ZF9	ZN24	ZN10	P=0.05	P=0.01
$3\frac{1}{4}$	4.3	3.4	2.0	3.0	2.6	1.25	1.64
$5\frac{1}{4}$	20.2	14.6	14.7	10.0	9.4	7.54	9.90
$6\frac{1}{4}$	13.0	8.8	6.7	5.7	7.8	4.23	5.56
$7\frac{1}{4}$	17.2	10.3	9.8	13.8	7.1	9.83	12.92
Mean totals 4 years	54.6	37.1	33.2	32.5	26.9	7.54	9.92

7. The second trial, planted at the station in December, 1940, compares :—

(*a*) Unselected seedlings raised from ordinary bulk seed.

(*b*) Selected seedlings raised from open-pollinated seed taken from four good yielding mother trees.

(*c*) Buddings from the same four mother trees on *montana* seedling stocks.

(*d*) Buddings from the same four mother trees on *fordii* seedling stocks.

8. The experiment comprises six randomized blocks of four plots each of twelve trees. The plots for treatments (*b*) (*c*) and (*d*) have been sub-divided to accommodate the progeny of the four mother trees. The mean yield per tree for different types of planting material over five seasons are shown in Table 3. The buddings on *montana* root stock have given significantly higher yields than any other treatment (P=0.01) in each and every year except in 1944 when there was no difference between buddings on the two kinds of stocks. On the mean total yields for five years, the buddings on *montana* stock are significantly better than all other treatments, having given approximately double the yield of selected seedlings. Buddings on *fordii* stock are significantly better than either type of seedling on mean total yields. On the other hand there is no difference between the two types of seedlings.

TABLE 3. MEAN YIELDS PER TREE, LBS. AIR DRY HULLED SEED

Year	Age years	Buddings		Seedlings		Sig. diff.	
		Montana stock	*Fordii* stock	Selected	Unselected	P= 0.05	P= 0.01
1944 ..	$3\frac{1}{4}$	1.8	1.7	0.9	0.7	0.36	0.50
1945 ..	$4\frac{1}{4}$	6.7	3.7	3.1	2.3	1.41	1.95
1946 ..	$5\frac{1}{4}$	9.3	6.2	4.6	4.4	1.78	2.46
1947 ..	$6\frac{1}{4}$	14.7	8.0	7.4	6.3	3.22	4.45
1948 ..	$7\frac{1}{4}$	21.3	14.0	11.2	9.6	3.66	5.06
Mean total yield per tree 1944–48		53.8	33.7	27.1	23.3	4.10	5.68

TABLE 4. MEAN GIRTH PER TREE, INCHES, TAKEN AT 3 INCHES ABOVE UNION, AT AGE $7\frac{1}{2}$

Buddings		Seedlings		Sig. diff.	
Montana Stock	*Fordii* Stock	Selected	Unselected	P=0.05	P=0.01
23.3	20.2	28.3	27.2	1.47	2.03

9. Table 4 shows the mean girth per tree in 1948 at 3 ins. above the union or 3 ins. above the origin of the single shoot allowed to develop on the seedlings. The girth of both types of seedlings has been significantly greater than that of either type of budding in all seasons. Buddings on *montana* stock have been significantly more vigorous than those on *fordii* stock in all seasons after the first. That the difference in vigour between buddings and seedlings is due mainly to reduction in vigour due to budding rather than to the presence of a proportion of predominantly male trees in the seedling plots, is shown by the fact that the mean girth figures which have been obtained for bearing trees only, in seedling plots at 7½ years old are 28.8 ins. for selected seedlings and 26.2 ins. for unselected seedlings, both of which are significantly greater than the figure for buddings on *montana* stock at P=0.01. Since there is a marked positive correlation between vigour as represented by measurements of girth and spread and yields, this reduction in girth, due to budding, no doubt mainly accounts for the fact that budded clones in general have not given yields as high as their seedling mother trees at the same age.

10. Table 5 gives the mean total yields of the budded and seedling progenies of the different mother trees for the five seasons. Of the buddings of *montana* stock, the clone ZM13 is significantly better than all others (P=0.01) and ZF9 has again given a significantly lower yield than any of the others (P=0.01). From the yields shown in Table 6 it will be seen that ZM13 is again the highest yielder in every season except the first and ZF9 has always been the poorest clone. On *fordii* stock there is less variation between clones, the only significant difference being between clones ZH14 and ZM8. It will be noted that all clones except ZF9 have given significantly better yields on the *montana* than on the *fordii* stock. The marked superiority of the seedling progeny of ZM8 over the other selected seedling families is due entirely to the small proportion of predominantly male trees occurring in plots of this progeny which is almost certainly fortuitous. All clones on the *montana* stock have given significantly better yields than the seedlings derived from the same mother tree and all except ZF9 are significantly better than the seedlings of any family. This trial has therefore clearly shown the superiority of buddings over selected or unselected seedlings.

TABLE 5. MEAN TOTAL YIELDS PER TREE FOR FIVE SEASONS, LBS. AIR DRY HULLED SEED

Treatment	Clones				Sig. diff.	
	ZM8	ZM13	ZH14	ZF9	P=0.05	P=0.01
Montana stock	56.0	66.2	53.7	39.0	5.37	7.06
Fordii stock	29.5	33.8	37.4	34.1		
Selected seedlings	43.2	25.6	19.2	20.6		

TABLE 6. MEAN YIELDS, LBS. AIR DRY HULLED SEED

Age years	ZM8		ZM13		ZH14		ZF9		Sig. diff. per tree	
	per tree	per acre	per tree	per acre	per tree	per acre	per tree	per acre	P= 0.05	P= 0.01
3¼	1.7	95	1.9	106	2.5	140	1.2	67	0.55	0.77
4¼	6.1	342	9.3	521	6.1	342	5.4	302	1.86	2.44
5¼	9.8	549	11.2	627	9.8	549	6.5	364	1.61	2.11
6¼	14.8	829	16.9	946	14.7	823	11.9	666	4.01	5.27
7¼	23.6	1,322	26.9	1,506	20.6	1,154	13.9	778	4.92	6.47

Clone Trials

11. In addition to the two experiments already described a number of clones are under trial in various field experiments but, owing to the hail damage, no records are yet available from the newer clones. The yields from five clones which occur in the inter-cropping trial mentioned in paragraph 15 are shown in Table 7 and 8; figures being given for all treatments and also for the best treatment, which was inter-cropping with soya beans. Both sets of figures show that in all seasons and on mean total yields the B-type clones 14 and 10 have given significantly higher yields than all others (P=0.01), clone 10 being better than 14 when all plots are considered but not on soya plots only. The intermediate clone ZF9 is inferior to all others as shown in the trial previously described (Tables 5 and 6). The girth measurements at 7½ years old, shown in Table 9, show that the two A-clones ZN24 and ZM8 are significantly more vigorous than all others (P=0.01) and clone 10 more so than clone 14 and ZF9 (P=0.01). The difference in size and habit of trees is very evident in the field. It is not yet possible to say whether the A-or B-type clones in this or other experiments will prove the better over a period of years. So far the early cropping characteristics of the better B-type clones has given them the advantage, but in view of lack of vigour it seems probable that many of them such as clone 14, will reach peak production early and will subsequently be out-stripped by the more vigorous and slower maturing A-types. The majority of B-type clones, which are of less than medium vigour but are precocious croppers, may find their best use as fillers between permanent A-trees, being cut out as the latter mature. On the other hand, the relatively strong B-clone known as number 10 may maintain higher yields over longer periods and may be worth planting as permanent trees at a suitable spacing.

Table 7. Mean Yields, Lbs. Air dry Hulled Seed per Tree

Season	Age years	Clones					Sig. diff.	
		ZN24	ZM8	ZF9	14	10	P=0.05	P=0.01
	All Plots							
1943 ..	2	0.7	0.5	0.6	2.1	2.2	0.31	0.41
1944 ..	3	1.6	1.6	2.1	5.0	4.0	0.61	0.80
1945 ..	4	6.3	5.0	5.1	10.0	9.2	1.39	1.82
1946 ..	5	10.1	9.5	7.8	16.4	19.8	2.00	2.63
1947 ..	6	10.4	12.2	9.2	17.7	20.9	1.76	2.31
1948 ..	7	13.9	15.6	11.2	24.6	25.7	2.31	3.04
Mean total yield 1944–48		42.3	43.9	35.4	73.6	79.5	2.79	3.66
Soya Plots	Only							
1943 ..	2	1.0	0.4	0.8	2.4	3.1	—	—
1944 ..	3	3.4	2.2	3.6	7.7	7.6	—	—
1945 ..	4	9.1	6.6	7.6	13.9	13.3	2.78	3.65
1946 ..	5	14.6	10.7	11.2	23.5	27.6	2.83	3.72
1947 ..	6	13.9	15.2	12.0	21.3	12.7	3.50	4.63
1948 ..	7	18.2	16.6	12.8	27.9	28.5	4.63	6.08
Mean total yield 1944–48		59.2	51.3	47.2	94.2	99.7	5.57	7.33

Table 8. Mean Yields, Lbs. Air dry Hulled Seed per Acre, 1948

	ZN24	ZM8	ZF9	14	10
All plots	778	874	627	1,378	1,439
Soya plots only	1,019	930	717	1,562	1,596

Table 9. Mean Girth, Inches, at 3 Inches above Union, 7½ Years old

ZN24	ZM8	ZF9	14	10	Sig. diff.	
					P=0.05	P=0.01
25.3	25.4	20.1	20.1	22.5	1.20	1.58

12. A further example of the clone yields being obtained is given in Table 10 which shows yields from a 6 × 6 Latin square clone trial with four trees per plot at Naming'omba Estate. On mean total yields clone 14 is better than all others, clones ZO4 and ZC2A are better than the other three, and ZM13 and B741 are better than ZN24, all these differences being significant at 1 per cent. level. It will be noticed that clone 14 has cropped particularly heavily in the first season when it was significantly better than all others but if the next two seasons are considered individually there is no significant difference between 14, ZO4 and ZC2A.

Table 10. Mean Yields, Lbs. air dry Hulled Seed Per Tree

Year	Age	Clones						Sig. diff.	
		ZM13	ZN24	ZC2A	B741	14	ZO4	P=0.05	P=0.01
Mean totals									
1946 ..	3¼	4.9	4.4	11.3	4.7	16.6	12.0	2.74	3.79
1947 ..	4¼	16.7	13.7	22.2	16.6	24.1	20.5	4.94	6.84
1948 ..	5¼	22.9	17.5	32.2	21.3	34.3	30.1	5.30	7.33
Mean totals 3 seasons		44.6	35.6	65.7	42.6	75.0	62.6	4.94	6.83
Per acre, 1948		1,282	980	1,803	1,193	1,921	1,686		

Clonal Seedlings

13. In 1941, three small isolated plots of buddings were planted with a view to finding out if by crossing between themselves these buddings would produce seeds which would give rise to a high yielding stand of trees. Seedlings raised from the 1944 crop from these plots were planted out in a trial which included plots of buddings of the clone ZM8 for comparison. No yield records are yet available from this experiment, but it has been observed that the percentage of predominantly male seedlings in the progenies from the three plots is only 28 per cent.

14. *Legitimate Seedling Families* have been produced by selfing, or crossing between, high-yielding mother trees in the hope that amongst the bearing trees in these families there will be some really outstanding yielders which can later be propagated to form new and superior clones of buddings. A total of 650 of these legitimate seedlings belonging to 13 families have been established but no yield records are yet available as unfortunately the 1948 crop was destroyed by hail. The percentage of predominantly male trees varies in different families, ranging from 18.7 per cent. to 42.8 per cent. with a mean for all families of 26.1 per cent. Despite the fact that a B-type tree was used as one of the parents in four of the families there are only five B-type seedlings amongst 650. All families with two A-type and two with one B-type parent consisted entirely of A-type trees. This, seems to indicate—that the B-type characteristic is recessive. No families with both parents of B-type have yet been produced.

15. It is probable that the number of first-class selections from which it is eventually desired to propagate will be quite small, but in order to save time and obtain more accurate information buddings are being made from a number of the most promising bearers after recording the first two crops. The loss of the 1948 crop has delayed this, but 10 buddings from a number of bearers have already been made after an examination of the 1948–1949 crop on these trees had indicated heavy crops. Thus it will in due course be possible to base a final selection, not only on the yield of a single outstanding seedling, which may be affected by soil, etc., but also on the performance of a small number of buddings derived from it.

16. Some 60 hybrid seedlings were produced by crossing between good *montana* and *fordii* trees and are now five years old. Fifty of them have produced only staminate flowers and the remaining ten, although bearing a few pistillate flowers, have given negligible yields.

Cultural and Manuring Experiments

17. Results over several seasons are only available from a single field experiment in which inter-cropping with annuals is practised. This is a randomized block trial, begun in December, 1940, which compares inter-cropping during the first four rainy seasons with (*a*) soya beans, whole plants being removed for threshing at harvest time; (*b*) maize-stems being buried after harvest; (*c*) velvet beans—dug in as green manure; and (*d*) a cover crop of *Calapogonium mucunoides* which was intended to be permanent but which died out early in the fourth season owing to failure to set seed. There were six replications with plots of 15 trees, these plots being split to accommodate the five clones mentioned in paragraph 7. The results over a period of five years are shown in Table 11. In all seasons and on mean total yields for five seasons, plots under soya beans have given the highest yield, being significantly better than all other treatments at the 1 per cent. probability level. The girth measurements for 1948 show that the trees in the soya plots were significantly bigger than all others (P=0.01), there being no significant difference between the latter. The amount of cultivation and weeding done each year was about equal on soya and maize plots but was appreciably less on the velvet bean plots whilst *Calapogonium* plots simply received two hand-weedings after sowing. The fact that the superiority of soya beans as regards both yields and growth of tung which has persisted up to four seasons after cessation of inter-cropping, seems to indicate that the trees have benefited markedly from a good start resulting from thorough cultivation accompanying an inter-crop which takes little from the soil. Velvet beans as a green manure or a cover crop, of *Calapogonium mucunoides* have presumably been less successful because these plots received less cultivation than those under soya. Inter-cropping with maize, which received about the same amount of cultivation as soya bean, presents an intermediate position probably because this crop took more out of the soil than the others.

TABLE 11. MEAN YIELDS, LBS. DRY SEED PER TREE

Year	Age, years	Inter-crop				Sig. diff.	
		Soya	Maize	Velvet bean	Calapogonium	P=0.05	P=0.01
		Mean yields, lbs. dry seed per tree					
1944 ..	3½	4.9	2.3	2.3	1.8	0.63	0.87
1945 ..	4¼	10.1	7.2	6.3	4.8	1.43	1.95
1946 ..	5¼	17.5	11.1	10.2	12.0	1.90	2.63
1947 ..	6¼	17.0	14.4	13.3	11.6	2.38	3.29
1948 ..	7¼	20.8	17.4	16.9	17.7	3.26	4.51
	Mean totals	70.3	52.4	49.1	48.0	6.24	8.63
		Mean girths, inches					
1948 ..	7¼	24.1	22.9	22.0	21.6	1.31	1.81

18. While it is generally accepted that tung requires reasonably thorough cultivation, particularly during the earlier years, this unfortunately has not been the general practice on estates owing to the shortage of labour. This gives rise to the problem of finding a system of cultivation which would minimize labour requirements, but at the same time promote satisfactory growth of the trees. With this object in view, an experiment was begun in the 1946–47 season, with trees planted in January, 1945, in which the following treatments are being compared over an initial period of four seasons :

(*a*) Inter-cropping annually with soya beans.

(*b*) Inter-cropping with a rotation of crops comprising maize, groundnuts, maize and beans.

(*c*) Inter-cropping with a permanent cover crop of *Glycine javanica*.

(*d*) No inter-cropping and no cultivation beyond circle-weeding under the branches ; grass and weeds slashed twice a year and placed around the tree as a mulch, a dressing of sulphate of ammonia being applied to the trees each season mixed with the first grass mulch.

The sulphate of ammonia was applied at 1 lb. per tree during the first season and 2 lbs. per tree in the two following seasons. In all plots the trees are kept clean circle-weeded under the spread of the branches, the weeds being left on the surface after hoeing. Thus a comparison is effected between two systems (*a*) and (*b*) in which thorough cultivation is given and a return obtained from an inter-crop but in which the labour requirements are high ; one system (*c*) with a lower labour requirement but no return from an inter-crop, and a system (*d*) which reduces labour to a minimum. The trial comprises six randomized blocks with plots of 36 trees each, the latter being split for clone testing. In any event it would not yet be possible to record any definite results from this experiment but, in actual fact, no yield records have yet been obtained, as the 1948 crop was destroyed by hail. Observations do not so far indicate any difference between the trees under the different treatments in size or density of the foliage and there is no significant difference between girth measurements taken in 1948. It seems probable that the addition of a small dressing of sulphate of ammonia to the grass mulch has so far made up for the lack of cultivation and it has been observed that the fertilized grass mulch rots down very rapidly, thus being equivalent to a form of compost.

19. Supplementary to the above trial a small experiment was laid down adjoining it in order to compare the effect of the grass mulch with and without the addition of sulphate of ammonia. This comprises seven randomized blocks of three plots each of five trees to compare the following treatments :

(*a*) Inter-cropping with soya beans as in treatment (*a*) of paragraph 18 ;

(*b*) As in treatment (*d*) of paragraph 18 ;

(*c*) As in treatment (*d*) of paragraph 18, but no sulphate of ammonia applied.

Here again, no yield records are available but the appearance of the grass plot trees without sulphate of ammonia clearly indicates lack of available nitrogen, the foliage being less dense than on other plots and often of a poor yellow colour. The unmanured trees on grass also made less growth than those in soya or manured grass plots, the 1948 girth measurements for the former being significantly less than those for the latter two treatments (Table 12).

TABLE 12. MEAN GIRTH AT 3 INCHES ABOVE UNION, INCHES

Soya	Grass with S/A	Grass unmanured	Sig. diff.	
			P=0.05	P=0.01
11.7	11.9	9.8	1.5	2.1

20. Manurial Experiments, the earliest of which was started in the 1946–47 season, have so far only shown a response to nitrogen. Thus, in a factorial fertilizer trial comparing all combinations of the presence or absence of nitrogen, phosphate and potash with eight replications and six trees per plot, a significant response to nitrogen applied as 3 lbs. per tree of sulphate of ammonia was obtained in both yields and growth in 1948 (Table 13). A marked response to nitrogen has also been evident in the early growth of six small experimental plots which were planted in the Vipya area in January, 1947. These blocks, which are scattered over a wide area with a view to observing the growth of tung in a large new potential tung-growing area, each consist of five plots of eight trees in which the following manurial treatments are compared :

O No manure ;

D 30 lbs. cattle manure per tree ;

N $\frac{1}{2}$ lb. sulphate of ammonia per tree ;

NP As N plus $\frac{1}{2}$ lb. superphosphate per tree ;

NPK As NP plus $\frac{1}{4}$ lb. of muriate of potash per tree.

Stronger growth and better foliage have been evident on the plots which received sulphate of ammonia and the 1948 girth measurements adjusted by covariance on the girth immediately below the bud patch at the time of planting (Table 14) show a significant difference in favour of these plots as compared with those receiving cattle manure or nothing. Experiments are now in hand both in the Vipya and at the Experimental Station in which different levels of nitrogen applications are being compared.

TABLE 13

	No nitrogen	Nitrogen	Sig. diff.	
			P=0.05	P=0.01
Yield, lbs. dry seed per tree, 1948 ..	1.89	2.95	0.13	0.18
Girth at 3 inches above union, inches, 1948	12.30	13.74	1.34	1.76

TABLE 14. MEAN GIRTHS IN $\frac{1}{4}$ INCHES (ADJUSTED BY COVARIANCE)

O	D	N	NP	NPK	Sig. diff.	
					P=0.05	P=0.01
30.1	30.7	35.9	35.9	36.2	0.65	0.89

21. A single experiment with locally available organic manures was begun in the 1946–47 season, with trees planted in December, 1943, and comprises six randomized blocks of five plots each of ten trees for the comparison of the following treatments which were applied in December, 1946, and December, 1947 :

O	No manure ;
N	Artificial fertilizer mixture of 2 lbs. of sulphate of ammonia, 2 lbs. of superphosphate and 1 lb. muriate of potash per tree ;
FYM	Cattle manure at 200 lbs. per tree ;
TC	Tung press cake of 100 lbs. per tree ;
CS	Cotton seed at 100 lbs. per tree.

The yields for the only crop harvested since the manurial treatments became effective, together with the same yields adjusted by covariance on the 1947 crop (which was set before the manures were applied and showed no significant differences between treatments) are shown in Table 15. On both sets of figures the plots receiving tung cake are significantly better than all other treatments except cotton seed whilst on the adjusted means cotton seed is better than no manure. The adjusted girth measurements show that tung cake has given better growth than control or cattle manure. The dressing of 100 lbs. per tree of tung cake probably contains a greater amount of nutrient elements, particularly nitrogen, than all other dressings and it seems probable that the beneficial effect on the trees is due mainly to the relatively high nitrogen content in the tung cake.

TABLE 15

	O	N	FYM	TC	CS	Sig. diff.	
						P=0.05	P=0.01
Yields 1948, lbs. dry seed ..	3.3	3.8	2.9	6.2	4.6	1.56	2.13
ditto, adjusted by covariance	2.6	3.6	4.0	6.1	4.6	1.41	2.41
Girths 1948, inches, adjusted by covariance	13.8	14.1	12.9	14.9	14.2	0.89	1.21

Tea Experimental Station. Mlanje

Agricultural Officer in Charge : H. W. T. Webb

22. It should be noted that not all the experimental work which follows has been carried out on the Mlanje Experimental Station. Some has been carried out on tea estates in the Cholo and Mlanje Districts and the opportunity is taken here of expressing appreciation for the very willing and ready assistance and co-operation which has always been given to the staff of the Department by the managers and staff of the estates on which the work has been done.

Down-pruning old tea 1944 (Ruo Estate)

23. Details of this experiment were given in last year's Report. It is designed to settle an old local controversy on the treatment of old tea after down-pruning. It is contended by most estate managers that tipping at 18 ins. after a down-prune to 14 ins., followed by an up-pruning of 1 in. yearly (*i.e.* treatment No. 4 which is the one commonly advocated in North India) might reduce yield or induce development of wood. For this reason the local practice of tipping at 27 ins., after a down-prune to 14 ins., is preferred.

24. The layouts and treatment given below are exactly the same as in 1947 and fortnightly records of leaf yields were taken through the season as before. The experimental plots were otherwise treated in exactly the same way as the rest of the estate. The treatments are :—

(1) Pruned down to 14 ins. and then tipped to 27 ins. ; cut across the following year to 22 ins. and tipped to 26 ins. pruned the next year to 20 ins. tipping at 4 ins. and pruned up to 2 ins. yearly tipping at 4 ins.

(2) Pruned down to 14 ins. and then tipped at 27 ins. ; pruned up yearly 1 in. tipping at 27 ins. until 18 ins. pruning level reached and then tipped to 4 ins. yearly.

(3) Pruned to 14 ins., tipped 27 ins. ; pruned 24 ins., tipped 28 ins. ; pruned down yearly, inch by inch, until 20 ins. reached, tipping 4 ins. up each year ; thereupon pruned up 1 in. yearly until 24 ins. reached, tipping 4 ins. yearly.

(4) Pruned 14 ins. and tipped 18 ins. ; pruned up 1 in. yearly and tipped at 4 ins.

Results

TABLE 16

YIELDS 1947–48 SEASON : FORTNIGHTLY RECORDS

Treatments	(1)	(2)	(3)	(4)	Significant Difference
Yield/acre in lbs. made tea	959 ..	810 ..	905 ..	940 ..	None

25. There was no significant difference between treatments in the 1947–48 season. This is the fourth season of the experiment and in only one, 1946–47, have the results been significant when (1,) (3) and (4) gave significantly higher yields than (2). Although treatment (4) only gave the second highest yield, instead of the highest as in previous years ; the conclusion remains unaltered that the treatment does not depress yields, a result that conforms with findings in North India. In addition to the yield factor, however, treatment (4) is of special interest in that the period between one down-prune and the next is appreciably lengthened as the bush rises more slowly. This experiment also continues to confirm others which indicate that less crop is lost by tipping low.

Tipping levels of China Jat and influence of pruning methods on tipping 1944 (Ruo Estate)

26. This experiment, the previous history of which is given in the 1947 Report, consists of a randomized block design with six treatments replicated six times. The treatments are as follows :—

(1) Cut across and tipped at 2 ins.
(2) Cut across and tipped at 4 ins.
(3) Cut across and tipped at 6 ins.
(4) Clean-pruned and tipped at 2 ins.
(5) Clean-pruned and tipped at 4 ins.
(6) Clean-pruned and tipped at 6 ins.

27. A previous experiment with Indian Jat indicated that yield was lost by tipping higher than 4 ins. above the pruning mark and the purpose of the present experiment is to determine the effect of different tipping levels on China Jat. Fortnightly records of leaf yields were made throughout the season.

Results

TABLE 17. YIELDS 1947–48 SEASON : FORTNIGHTLY RECORDS

Treatments	(1)	(2)	(3)	(4)	(5)	(6)	Significant Difference
Yields p/acre in lbs. made tea ..	723 ..	672 ..	646 ..	772 ..	742 ..	647 ..	None

28. There was no significant difference in yield between the treatments in the 1947–48 season. Results from the two previous years were also insignificant although the 2 ins. tipping on clean-pruned tea showed higher yields than other treatments. The figures bear out the conclusions drawn from the previous two years' experiment and continue to show that in the case of China Jat, crop appears to be lost by tipping higher than 2 ins. in the case of clean-pruned tea with indications that the same applies to cut-across-pruning. The results although inconclusive do in fact support not only the findings obtained in the earlier work on Indian tea but also of those of Experiment No. 1, on the down-pruning of old tea, that tipping higher than 4 ins. does definitely reduce yield.

Treatment of young tea 1942 (Mlanje Experiment Station)

29. This experiment was planted in March, 1942, to investigate different methods of bringing young tea into bearing. The layout was a 6×6 latin square and the initial treatments were as follows :—

(1) At 12 months to 18 months after planting the young plants were centred (*i.e.* the central main stems were removed to encourage the bush to spread). The bush was cut level at 14 ins., tipped to 27 ins. and then plucked.

(2) From nine months onward the young plants were lightly plucked, the bush was pruned at 30 months for the first time.

(3) The bush was cut across to 14 ins. at 18 months, tipped at 27 ins., and then up-pruned 2 ins. early anyd tipped at 4 ins. above pruning level.

(4) The bush was cut across to 8 ins. at 18 months, tipped at 27 ins., and then pruned to 14 ins. at 30 months.

(5) The bush was cut across to 16 ins. at 18 months, left two years and then up-pruned 2 ins. yearly.

(6) The bush was allowed to grow for $2\frac{1}{2}$ years and then pruned at 14 ins. and up-pruned 2 ins. yearly.

Results

TABLE 18. YIELDS 1947–1948 SEASON : WEEKLY RECORDS

Treatments	(1)	(2)	(3)	(4)	(5)	(6)	Significant Difference
Yield per acre in lbs. made tea	1,050 ..	1,082 ..	1,062 ..	1,011 ..	1,073 ..	1,030 ..	None

As in the two previous years there was no significant difference in yield between the treatments. The following Table gives the accumulated yields per acre from each treatment for 1942 to 1948 :—

TABLE 19. YIELDS 1942–48 SEASON : WEEKLY RECORDS

Treatments	1	2	3	4	5	6
Yields per acre in lbs. made tea	2,626 ..	2,847 ..	2,740 ..	2,558 ..	2,784 ..	2,445

30. The conclusions to be drawn from this experiment are that the different treatments applied to bring the tea into bearing reflect no significant difference in yield to date. It should be noted that treatments Nos. 2 and 5 encouraged the spread of the bushes and therefore gave greater soil protection. These treatments also gave an earlier return of leaf and give indications that a higher accentuated return per acre can be expected from their adoption.

31. The system of allowing two bushes to run up for $2\frac{1}{2}$ years before pruning has nothing to recommend it.

32. A further conclusion is that young tea responds to hard treatment during the early stages of growth.

Spacing of tea 1941 (Mlanje Experiment Station)

33. This experiment was laid down in 1941 to investigate the optimum spacing of tea and its effect on yield. Experiments in other tea-growing countries have indicated that closed spacings give higher yields and to date this has certainly been confirmed.

34. The layout of a randomized block design with four treatments replicated four times. The plots were plucked and weighed weekly : treatments are as follows :—

(1) 3½ ft. by 3½ ft.

(2) 4 ft. by 4 ft.

(3) 4½ ft. by 4½ ft.

(4) 5ft. by 5 ft.

Results

TABLE 20

YIELDS 1947–1948 SEASON : WEEKLY RECORDS

Treatments	(1)	(2)	(3)	(4)	Sig. diff. P=0.05	Sig. diff. P=0.01
Yield	1,720 ..	1,490 ..	1,415 ..	1,295 ..	155	223

35. Once again this experiment has shown that closer spacings give higher yields and the results confirm those of last year. Other close-planted tea plots on the station support this finding.

Investigation of different methods of pruning and extending the pruning cycle, 1938. (Mlanje Experiment Station)

36. This experiment was designed to compare different methods and frequency of pruning on Indian Jat. It was started in 1938 on young tea which had just come into bearing and has been continued through three pruning cycles of three years each ; the bushes planted out as stumps were four years old when the experiment began and are now thirteen. The layout is a 6 × 6 latin square and treatments are as follows :—

(1) clean-pruned every year ;

(2) cut-across every year ;

(3) cut-across and centre cleared out every year ;

(4) clean-pruned every other year, *i.e.* on a two-year cycle (pruned 1947, unpruned 1948) ;

(5) cut-across every other year *i.e.* on a two-year cycle (cut across 1947 not cut 1948) ;

(6) clean-pruned every third year *i.e.* on a three-year cycle (unpruned 1945 and 1946, pruned 1947, unpruned 1948).

The plots were plucked and weighed weekly during the season.

Results

TABLE 21

YIELDS 1947–1948 SEASON : WEEKLY RECORDS

Treatments	(1)	(2)	(3)	(4)	(5)	(6)	Sig. diff. P=0.05	Sig. diff. P=0.01
Yield per acre in ..	1,341 ..	1,086 ..	1,037 ..	1,437 ..	1,027 ..	1,297 ..		

37. The results again gave highly significant differences between treatments. The clean-pruned plots (1), (4) and (6) gave significantly higher yields than those which were cut-across (2), (3) and (5). There was however no significant difference between the various clean-pruned plots (1), (4) and (6) and the " cut-across " plots (2), (3) and (5). It should be noted, however, that treatments (1) and (4) clean-pruning every year or every other year, were significantly better than treatments (2), (3) and (5), the cutting across every year, every other year and every third year, at P.=0.01 level of significance. At this level too, treatment (6) was significantly greater than treatments (3) and (5).

38. This investigation has now continued through three cycles since the tea came into bearing and last season's results are from the first year of the fourth cycle.

39. The results from the first three-year cycle (4-6 years old) showed that the cut-across (2) and cut-across with centre clean cut (3) gave significantly greater yield than the clean-pruned treatments. In the second year of the first cycle, treatments (2) and (3) again gave significantly greater yield than the yearly clean-pruned tea (1) and the unpruned tea cut-across the year before (5) also gave a significantly greater yield than the yearly clean-pruned tea (1).

40. The results in the third year of the first three-year cycle showed the same results except that the clean-pruned tea left unpruned for three years (6) gave a greater yield than the yearly clean-pruned tea (1).

41. Treatments (2), (3) (5) and (6) showed a good spread of bush, completely closing the rows.

42. The results during the second three-year cycle (8–10 years old) continued to show the same tendencies as above, and there was a 20 per cent. increase in yield obtained from the extended cycle treatments and the lightly pruned (cut-across) treatments, over the traditional annual clean-prune (1).

43. The results covering the third three-year cycle (11—13 years old), concluded in 1947, showed during the first year of the period 1944–45 that there were no significant differences in yield between the three annual treatments (1), (2) and (3), or the two-year extended pruning cycle treatments (4), (the two-year cycle or clean-prune treatment. In 1945–46, treatment (6) again gave a significantly higher yield than (5). The two-year cycle clean-pruned treatment (4) gave a significantly higher yield than all the cut-across treatments (2), (3) and (5). There was no significant difference between the clean-pruned treatments (1), (4) and (6).

44. The last year of this three-year period, 1946–47, showed that the clean-prune treatments (1) and (4) gave higher yields than the cut-across treatments as well as the three-year cycle clean-pruned treatment (6).

45. The conclusions reached so far from this investigation indicate that up to about 10 years of age, from planting as stumps, the highest yield is obtained from cut-across treatments (2), (3) and (5) and that extended pruning cycle treatments (4), (5) and (6) give greater yields than an annual clean-prune (1), *i.e.* yield is definitely lost by an annual clean-prune during this period.

46. A reverse trend has resulted during the third period, when the tea was 10 to 13 years old (1944–47). During this period the clean-pruned treatments (1), (4) and (6) gave greater yields than those that had been cut-across (2), (3) and (5), and there are now indications that the annual cycle (1) and two-year cycle (4) clean-pruned treatments are beginning to give higher yields than either the two-year cycle cut-across (5) or the three-year clean-prune (6).

47. The total yields from the different treatments over the 10 years of recordings still indicates that loss of yield results from an annual clean-prune on Indian tea, but the results from the past season, strengthens the indication that highest yields are obtained from the two-year and three-year cycle, clean-pruned tea.

Cultivation Experiment (Mlanje Experiment Station)

48. This experiment was started in 1941 to investigate the effects of weeds on tea and to study methods of control. Results during previous years have indicated that cultivation to suppress weeds may not be necessary to obtain maximum yields and that in some years such cultivation may actually be detrimental to the tea.

49. The layout is a randomized block design including seven treatments replicated five times. The plots were plucked and weighed weekly and the treatments are as follows :—

(1) hand weeding ;
(2) weeds slashed ;
(3) weeds hoed and carried off ;
(4) weeds hoed and buried ;
(5) weeds hoed and left on surface ;
(6) no weeding at all : weeds left ;
(7) *Indigofera* and *Desmodium* cover.

Results

TABLE 22

YIELDS 1947–1948 SEASON : WEEKLY RECORDS

Treatments	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Sig. diff.
Yield per acre in lbs. made tea	1,134	1,101	1,332	1,265	1,038	1,072	1,141	None

50. There was no significant difference in yield between the treatments and the conclusions from from previous years still hold good, that provided the weeds are kept below the plucking surface their control is not as important a factor in obtaining maximum yields as has been supposed.

Time of application of Fertilizer on tea (Mlanje Experiment Station)

51. This experiment was designed to show the effect on yield of applying fertilizer to tea at different times of the season. The layout is a randomized block design comparing four treatments replicated four times and the plots were plucked and weighed weekly. Treatments are as follows :—

(1) whole application made in first week in November ;
(2) whole application made in first week of January ;
(3) half applied in first week of November and half in first week of January ;
(4) half applied in first week of November and half in first week of March.

52. The treatments have shown no significant differences in yield except in 1943 when treatment (4) gave a significantly higher yield than the other treatments. In most other years treatment (4) has given higher yields.

Results

TABLE 23

YIELDS 1947–48 SEASON : WEEKLY RECORDS

Treatments	(1)	(2)	(3)	(4)	Sig. diff.
Yield p/acre in lbs. made tea	1,137	1,019	1,080	1,094	None

53. There was no significant difference in yield between treatments and the conclusions drawn from previous years' results still stand, that the time of application of fertilizer has little effect on the yield of leaf.

Vegetation propagation trial 1945 (Mlanje Experiment Station)

54. Trials on vegetative propagation by means of leaf-cuttings were continued : the results showed that the method can be used successfully without special preparation of either nursery bed or leaf cutting but they must not be regarded as conclusive in any way. Further investigations are being carried out.

55. In spite of a poor nursery site and unsatisfactory shade cover, which allowed rain to reach the leaf-cuttings and cause leaf-rot, there was a 60 per cent. survival. The nursery beds were made up in the ordinary way, with compost added but with no special drainage layer of sand and stone ; nor were the leaf-cuttings treated with any growth promoting hormone. Local experience rather indicates that this treatment with hormones makes little or no difference to success but this requires confirmation. A drip-proof nursery shade must be considered as essential if serious losses due to leaf-rot are to be avoided. Raindrops penetrating the ordinary shade and falling on to the leaf-blades soon cause leaf-rot. Setting the cuttings at a slight angle, so that the leaf-blades shed any water which may fall on them, is an extra precaution against trouble.

56. There was little difference between cuttings taken from green or red wood or between single and double node cuttings. This needs further confirmation but if correct it is of great importance as the maximum amount of propagating material can be provided in the form of single-node green wood cuttings. A considerable difference in survival and rate of growth between cuttings from different parent bushes was again very noticeable.

57. The following experiments have been started but the results are not yet available.

(*a*) *The effect of different rates of application of Sulphate of Ammonia on tea*

Applications of sulphate of ammonia are made at the following rates per acre. The equivalent weights in Nitrogen are given :—

(i) Nil ;
(ii) 170 lbs. Sulphate of Ammonia equal to 35 lbs. Nitrogen ;
(iii) 255 ,, ,, ,, ,, ,, ,, 52.5 ,, ,, ;
(iv) 340 ,, ,, ,, ,, ,, ,, 70 ,, ,, .

(*b*) *Investigation of the effect of weeds and grasses on the yield of tea*

This experiment has been designed to test the effect on the yield of tea of the following :—

(i) weeds and grass together ;
(ii) weeds only ;
(iii) grass only ;
(iv) " Seychelles " grass ;
(v) Dub Grass (*Cynoden dactylon*) ;
(vi) clean hand-weeding.

(*c*) *The effect of different degrees of plucking on the yield of Indian Tea*

The composition of three plucking treatments on Indian tea :—

(i) Normal selective hard plucking to the janum, commencing in November or December and continuing throughout the main cropping season ;
(ii) complete close hard plucking to the janum as above ;
(iii) high selective plucking, leaving leaf above the janum during the main cropping season.

Agricultural Research Station. Lilongwe

Chief Agricultural Research Officer in Charge : S. T. Hoyle

Staff

58. Mr. S. T. Hoyle was in charge for the year. Mr. P.O. Wiehe was appointed Plant Pathologist and Mr. R. E. Jackson as Farm Manager, but neither were able to take up their appointments immediately and Mr. J. A. Miller, Agricultural Assistant, acted as Farm Manager from November to the end of the year.

Development

59. Disappointingly little was achieved. The station had not been surveyed and at the end of the rains, the proper time for opening new land, it was only possible to clear and dig a strip around the perimeter of the station, which will eventually be used for a tree shelter belt. Later a contour survey was made and it was possible to plan the station lay-out, and to prepare about ten acres ; this cleared land has been planted with maize to provide as much food as possible for 1949. More would have been done had more labour been available. Labour was not really scarce but it was decided that the building programme was of more immediate importance than field work, and the main labour force was put to brick-making and building.

Buildings

60. At the beginning of the year building was in the hands of the Public Works Department but in August this was taken over by the Agricultural Department. During the year a total of £2,860 was spent and the following work done :—

(i) two-bedroom house with servants, quarters completed ;
(ii) power house (now used as carpenter's shop) completed ;
(iii) grade II house built up to door level ;
(iv) grade III house foundations completed ;
(v) wing of laboratory, foundations completed.

61. In addition to the above there are certain stores in hand which have been bought but not used, such as bricks, water piping, timber and steel windows. Shortage of timber and poles slowed up the work greatly and would have been more marked but for the help received from officers of the Department of Agriculture in other districts. Most of the inefficient and unwilling labour was untrained and lack of European supervision till late in the year resulted in the loss of time and money.

Equipment

62. A considerable quantity of equipment for the laboratory and farm was ordered during the year but the only important items which arrived were a Fordson tractor and disc harrow. The development of the land will proceed much faster when all the tools have arrived.

Lisasadzi Tobacco Station. Kasungu

Chief Agricultural Research Officer in Charge : S. T. Hoyle

Staff

63. J. W. Guise was in charge of the station.

General

64. No effective planting rains fell before the end of December, so that all the tobacco had to be planted out between the 24th December and 7th January. From then onwards rains were well distributed and tobacco and other crops grew well. There were 35 acres planted with flue-cured tobacco and 10 acres of food crops including maize, sorghum, groundnuts and beans. There are now six barns, two, 16 ft. sq. and four, 12 ft. sq. At harvest there was insufficient barn accommodation, and more will have to be provided before the next season if the acreage is not to be reduced. Had it been possible to space out the plantings, harvesting and curing would of course have been easier.

Tobacco

65. Nurseries grew well with no damping-off and only slight trouble from cutworm. Planting-out was done under good conditions and a fair stand would have been obtained but for very severe loss from cutworms. Several replantings were made but the final stand in one field was not much more than 50 per cent. and the best field was estimated at 85 per cent. Standard Rhodesian tobacco fertilizer was applied to all fields at the rate of 300 lbs. per acre in three applications, 10, 20 and 30 days after planting. There was little disease except in one field. Largely owing to the depredations of the cutworm, yields were not very good and ranged from 625 to 240 lbs. of cured leaf per acre, with an average of 400 lbs. per acre despatched for grading. A further 60 lbs. per acre was too green to be sold in 1948 but will be sold next year. Two varieties were planted, Yellow Mammoth and Duquesne ; the former proved the better and will be used exclusively next year. Sales on the auction floor were variable. The first lot of about 4 tons ranged in value from 31½d to 50d per lb. with an average of just under 42d. The second lot averaged only 14.7d per lb. and the reason for this very big difference is not clear. Total receipts from sales amounted to £1,721. Generally, the tobacco was of good bright colour suitable for the cigarette trade with only a small proportion of the darker grades. Samples were sent to various manufacturers in England and reports were generally very favourable ; one firm only commented on " tang " and said they could not use this type of leaf.

Food Crops.

66. *Maize.* Four acres of maize were planted on a field which had been very heavily fertilized for tobacco the previous year and no further fertilizer was added. The yield was 1,200 lbs. grain per acre. Different amounts of fertilizers were applied on single observation rows of maize. The results were rather inconclusive but small dressings of nitrogen seemed most important.

67. *Sorghum.* Two acres of sorghum yielded about 1,200 lbs. per acre. The sorghum used was a tall-growing local variety.

68. *Groundnuts.* With no direct application of fertilizer, but on land which had been fertilized the previous year, the yield was low at about 400 lbs. nuts per acre. The addition of 75 lbs. of super-phosphate brought the yield up to 900 lbs. per acre and 250 lbs. phosphate increased the yield to 1,200 lbs. per acre. Rock phosphate seemed to have as good an effect as supers. These observations were made on small plots and the results must be confirmed.

69. *Beans.* Two sowings were made on the same field, the first in early December and the second at the end of February. The first planting gave the larger yield of 325 lbs. per acre and the second 205 lbs.

Discussion

70. This is only the second report on this station but it already seems fairly certain that good readily saleable bright tobacco can be produced although there are many problems yet to be solved. Damage by cutworm can be extensive but it is unlikely to be so every year and the use of new insecticides may be a feasible method of control. The most economic application of fertilizer has not yet been worked out nor has any work been done on the best rotations for the District. Food crops can also be grown and fair yields obtained partly on the residual fertilizer in the soil after a tobacco crop, but it may be necessary to make larger applications to ensure good yields.

FOOD CROPS

Makanga (Chiromo) Station

71. The following notes on the work carried out on native food crops during the year give a very poor picture of what is really being attempted. Owing to unfavourable weather conditions and to shortage of labour, especially the latter, a large amount of experimental work had to be abandoned before completion.

Maize-sesame inter-planting experiment

72. This experiment was started with the object of determining a satisfactory method of inter-planting sesame with maize ; a satisfactory result would not only increase sesame production on the Lower River but would also provide an alternative cash crop during the year when cotton growing is forbidden as a Red Bollworm control measure. It is designed on the factorial principle and consists of five blocks each with 12 plots containing the combinations of four spacings of maize with three dates of planting of sesame. Each plot is 126 sq. yds. in size.

Ref.No. 21/26.

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ZOMBA,

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73. The following treatments were applied :—

1. Maize planted in rows 3 ft. apart, 1½ ft. apart in the row and thinned to two plants per hole.
2. Maize spaced at 3 ft.×2 ft. with three plants per hole.
3. Maize spaced at 3 ft.×3 ft. with four plants per hole.
4. Control : Maize spaced at 3 ft.×3 ft. and left unthinned, *i.e.*, native fashion, average 3 plants/hole.

74. Sesame was transplanted at a spacing of 3 ft.×2 ft. between the rows of maize. The entire field was ridged at 3 ft. intervals ; the maize was planted on the ridges and the sesame transplanted from nursery plots on the following dates :—

A. *First planting* 12th February, 1948, from nurseries sown on 8th January, 1948.
B. *Second planting* 25th February, 1948, from nurseries sown on 23rd January, 1948.
C. *Third planting* 21st March, 1948, from nurseries sown on 14th February, 1948.

75. Both the maize and the sesame used were the varieties normally grown by African cultivators in the District. Five seeds of maize were planted in each hole and the plants were subsequently thinned out as the treatments required.

76. Sesame was broadcast in small nursery beds and subsequently transplanted to the plots when about a month old.

Yields of maize (cobs) were as follows :—

TABLE 24

Maize Spacing	3′×1½′	3′×2′	3′×3′	Control	Sig. diff. at P=0.05
Maize Yields in lbs./acre ..	208.9	182.7	220.5	306.8	131.2

The differences in yield were not significant.

TABLE 25

YIELDS OF SESAME (unthreshed) :

Treatments	1A	1B	1C	2A	2B	2C	3A	3B	3C	4A	4B	4C
Yields in lbs./ acre ..	64.83	31.50	—	24.58	29.12	5.38	53.70	3.76	3.84	19.51	17.79	4.45

TABLE 26

YIELDS OF SESAME (as affected by dates of planting)

Date of Planting	A	B	C
Yields of Sesame in lbs./ acre ..	40.65	19.63	3.42

TABLE 27

YIELDS OF SESAME (as affected by spacing of maize).

Maize Spacing	3′×1½′	3′×2′	3′×3′	Control
Yields of Sesame in lbs./acre ..	32.10	19.69	20.43	12.70

77. This year was a difficult one at Makanga owing to shortage of labour and unfavourable weather conditions. All yields were low and many plots failed to give any yield.

78. This experiment was first started in 1947 and the results then obtained indicated that sesame interplanted in early February was more successful than earlier or later dates of planting. This year's results would seem to confirm this although the results are not conclusive.

79. Last year sesame was planted directly into the maize field and the best yield obtained, 123 lbs. per acre, compared favourably with the yield from sesame planted in pure stand on the same field. This year the sesame was sown in nurseries and transplanted into the maize field after the plants had become established. It was hoped that the sesame would then be better able to withstand the competition of the maize. Unfortunately, owing to unfavourable conditions the results were inconclusive.

Organic Manurial and mulching experiment

80. The African cultivator on the Lower River normally leaves the stubble and debris from his crops lying in his garden after harvest-time to be collected and burned in October together with any weeds which may have grown up during the dry season. This may possess the advantage of providing soil cover, although a very thin one, during the dry season but would seem to be destructive of humus. The suggestion has been made, and is practised in the highlands, that stubble and weeds should be buried as soon after harvest as possible in order to allow them to rot before planting time. The objection has been raised that this system might lead to nitrogen starvation of the following crop, apart from the fact that preparation of the garden at the beginning of the dry season discourages weed growth and leaves the soil open to desiccation throughout the dry months. Results at Makanga in the past have indicated that a bare fallow had deleterious effects on the yield of the following crop. The object of this experiment is to determine the effect of burial of crop residues, to investigate various other methods of adding humus to the soil and to ascertain the effect of protecting the soil during the dry season either by means of a cover-crop (pigeon pea) or by mulching.

81. The experimental layout consists of six randomized blocks, each containing five plots of 216 sq. yds.

82. Treatments applied are :—

(1) All plant refuse buried as soon after harvest as possible (June) by placing the stubble and weeds, etc. in the old furrow and splitting the ridges over them.

(2) Plant refuse spread on the plot as mulch. The plot prepared in June but the refuse not buried but spread over the newly-made ridges.

(3) Plot left undisturbed after harvest, but cleared in October and all refuse burnt.

(4) Plot prepared in June and all weeds and stubble spread on the plot as mulch together with elephant grass (*Pennisetum purpureum*) from a plot of equal size. The mulch undisturbed at planting.

(5) Pigeon peas interplanted between the maize in February, harvested in October, uprooted and left on the plot.

The indicator crop is maize planted on ridges 3 ft. apart in the row and thinned to two plants per hole.

Yield of maize (unshelled cobs) :—

TABLE 28

Treatment No.	1	2	3	4	5	Sig. diff.	
Yield in lbs./acre ..	347.83	261.66	184.78	664.50	271.17	P=0.05 228.9	P=0.01 312.2

Yield expressed as percentage of control

	1946	1947	1948	*Uniformity Trial* 1945
Treatment 1 ..	92.6 ..	85.3 ..	188.2 ..	100.9
2 ..	105.8 ..	80.7 ..	141.6 ..	94.7
3 ..	100 ..	100 ..	100 ..	100
4 ..	105.7 ..	121.4 ..	359.6 ..	103.6
5 ..	92.3 ..	106.7 ..	146.8 ..	93.96

83. Treatment No. 4, heavy mulching, is better than all others at P=0.01. The differences in yields between the other treatments are not significant.

84. If the results over the period of the experiment are considered it is seen that although at first the burial of crop residues appeared to depress yields as compared with the control, there seems to be a tendency for yields to increase as a result of the addition of organic matter as compared with the control on which the yields are showing a tendency to decline. Further trials are required to elucidate this point.

85. The plots under treatments (4) and (5) and the control are afforded protection from the sun during the dry season, whereas the early cultivation of treatments (1) and (2) tends to discourage weed-growth. It is very likely that soil cover during the dry weather has an effect on yields which cannot unfortunately be estimated in this experiment.

Central and Northern Provinces

Acting Senior Agricultural Officer : C. J. Dawkins

86. With the acute shortage of trained staff in these two Provinces it was impossible to carry out the experimental programme which had originally been planned. A certain amount was accomplished but it has been decided to give the actual results in next year's Report.

Likuni Experimental Station, Lilongwe

87. This Station was without a resident Agricultural Officer all through the growing season and it was not until August, 1948, that the Chief Agricultural Research Officer took it over. The cropping programme was designed for much greater food production than usual and with the exception of tobacco seed, yields were good. Maize gave 21 tons from 30 acres. Tobacco suffered badly not only from the lateness of planting rains but from thieving out of the nurseries, which left only very small seedlings for planting out, and from the excessive rains immediately after planting out, in early January, which washed out many of the newly planted and diminutive seedlings. As a result the stand was very poor and lax methods of selection had to be employed to achieve even half the target of a two year's supply. 1,647 lbs. of seed, inadequate for even one year, was harvested from 25 acres.

88. The experimental programme was expanded because at planning time there was no question of the Agricultural Officer being removed ; these experiments were carried through by the Native Agricultural Instructor, but for the most part did not give significant results. The programme included a new box-ridging experiment at different slopes and with different planting times ; a trial of rock phosphate at three levels combined with a maize spacing trial when maize is grown on alternate ridges with groundnuts ; two experiments comparing methods of breaking new ground and one comparing methods of preparing last year's maize land ; a groundnut variety trial comparing strains carrying the same names but collected from various stations in the Protectorate ; an investigation into the residual effect of previous applications of compost and manure ; and the perennial maize cultivation experiment. Last year's tobacco seed dressing experiment was not repeated nor followed up.

Mwera Hill

89. The routine propagation of fruit trees continues and output of budded trees for issue has increased from about 250 mixed varieties in 1947 to 1,180 budded trees of citrus varieties and 820 of deciduous varieties ; buddings and plantings for 1949 and 1950 issues are being made on about double this scale. Selection and bulking of bean varieties is second to fruit on the programme ; trials of cereal and other temperate climate material have continued ; a small amount of vegetable seed selection for the benefit of the local native industry has been undertaken, and has given especially encouraging results with onions and tomatoes. Further investigations were made into methods of extraction of fibre from wild Banana, *Ensete Buchanani* (previously known as *Musa Livingstoniana*).

Sharpe Vale

90. The perennial maize experiment (also at Likuni, Chitala and Tiwi) continued at Golomoti, and cotton spacing and variety trials were again undertaken for the Cotton Specialist at Sharpe Vale. Labour has been even more troublesome there than in previous years. Tobacco was grown for seed for the first time and relieved some of the pressure on the short Likuni crop.

Nkhande

91. There is no experimental work here but extensive tree planting, with the aim of building up a reserve for Departmental requirements in the Central Province, has been continued vigorously. The original plan of putting in the trees under maize nurse crops planted by native squatters had to be abandoned. The natives only wanted to squat. Plantings have included various Pinus and Eucalyptus species, Black wattle, Mlombwa (from cuttings), Bamboo and the Fibre banana. The multiplication plots of misellaneous legumes and grasses have been maintained and new ones planted. The soil erosion and run-off measurements continue but the apparatus is primitive and the results must be accepted with caution. The rotational grazing trial plots, having been grazed almost uniformly bare, are, all being given a rest preparatory to making a new start on the 1st January, 1949.

Gochi Plot Kirk Range

92. The wheat variety trial has been repeated but next year will be planted on a new site. The Pyrethrum plot is to be replaced when new planting material comes from the Nyika. A half acre of wattle has been established nearby. Fibre bananas have been planted.

Tiwi, Dedza

93. The maize cultivation experiment was continued and for the first time tobacco has been grown for seed. The two acres set aside for the purpose fared little better than Likuni, and failed to produce one year's requirement for Tiwi market area. The main purpose of the station is timber production and a number of Eucalyptus, *Callitris* and *Cedrella spp.* were planted.

Fort Manning " Nyawsi " Plot

94. A new plot of 20 acres was opened up early in the year with the object of carrying out trials fo wheat, rice and potatoes and for tobacco seed production. A good start had been made in opening this small plot and plantings were up to schedule. It is served by an irrigation furrow and rices, including some from Hungary, are under trial at different flooding conditions. Fibre bananas have been planted, comparing the *Ensete Buchanani* with a smaller seeded species from Ncheu.

Nsaru—Lilongwe

95. A plot has been opened for tobacco seed production.

Mtsekwe Plot, Dowa

96. The 420 citrus budded last year are doing well and are to be distributed during the 1948/49 rains. Young bamboo plants and Persian lilac have been distributed. There is a keen demand for suckers from the collection of banana varieties, and for cuttings from the rogued cassava.

Kota Kota Rice Plot

97. The variety and method-of-planting trial of rices has been repeated. Bunds (in the Indian sense) have been made through the rice plot in an attempt to control flooding. Roguing of the cassava variety plots has continued and a new piece of land has been prepared for the propagation of fruit trees suitable for the Lake-shore.

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